



XL Insurance

# Landfill and material recycling facilities

**SAFETY AND BEST  
MANAGEMENT  
PRACTICES**

An AXA XL  
environmental  
whitepaper





# Landfills and Material Recycling Facilities (MRFs) pose a unique variety of health and safety risks due to the nature of their operations.

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These can include construction, vehicular traffic, waste screening and disposal, heavy equipment operation, and exposure to dangerous gases, noise, disease vectors, chemicals, and other serious risk factors. This bulletin explores the hazards faced by solid waste employees and highlights measures intended to help mitigate these risks. The safety programs discussed are intended to provide employee awareness of best management practices and do not replace the need for regulatory-required training and ongoing safety management. According to the U.S. Bureau of Labor Statistics, “refuse and recyclable material collectors were the 6th deadliest occupation in the U.S. in 2019”. This unfortunately equated to 43 worker deaths. This represents an increase over recent years, particularly in the private sector where approximately 75% of fatalities are attributed to transportation incidents.

As reported by the Solid Waste Association of North America (SWANA), the illness and injury rates for landfills over the past 10 years has averaged 5.1 cases per 100 fulltime employees. Overexertion and bodily reaction, contact with objects and equipment, falls, transportation incidents, and exposure to harmful substances and environments are cited as the most common injury classifications.

Fortunately, many debilitating worker injuries can be avoided if landfill and MRF operators access the hazards at their facilities and implement detailed, site-specific health and safety plans that address the exposures present. Of course, a plan is only effective when combined with initial and ongoing employee safety training, and the consistent enforcement of safety policies and procedures.



## Vehicle hazards and traffic control

**Heavy equipment such as compactors, loaders, bulldozers, dump trucks, and trash trucks are delivering, dumping, moving, covering, or compacting trash in often congested portions of the landfill, such as at the working face where most of the activities occur. Hazards to workers can include being struck or crushed by vehicles and heavy equipment; especially while the vehicles are operating in reverse.**

### Traffic control

Whenever possible, one-way traffic flow patterns should be used to minimize cross traffic and the need for backing. Blind corners should be eliminated at intersections, and traffic mirrors and directional signs should be installed. It is important to design and maintain roads to accommodate heavy equipment and vehicles and eliminate tight corners, steep grades, rutted roads, potholes, and other road hazards. Post speed limits to ensure that traffic is operated at safe speeds. Safe clearances should be established, with least one vehicle width maintained especially around the working face.

### Pedestrian/worker control

Being at the base of a landfill can be particularly dangerous, and the number of pedestrians should be limited in that area as much as possible. Designate and clearly mark pedestrian paths and ensure that equipment operations are safely kept away from these areas. Require truck drivers to remain in their cabs while unloading trash and move their trucks to separate areas away from heavy equipment and other vehicles when they need to leave the cabs to secure doors, tarp trailers, or clean the trucks. And most importantly the practice of “rummaging” on the landfill should be strongly discouraged!

### Visibility

If workers must be on foot, visibility is of paramount importance. High-visibility clothing, such as reflective safety vests and hardhats should be worn by all ground crew, as well as drivers and equipment operators when outside of their vehicles. If a spotter is required, they must always remain visible to the driver and maintain continuous communications via radio or standard hand signals. Workers should never assume that the driver or equipment operator sees them and stay clear of moving vehicles as much as possible.

### Vehicle cameras

Mobile equipment and delivery trucks require good, all-around visibility that eliminates blind spots. Video cameras are an effective means to monitor the potential blind spots around vehicles. Color cameras work the best in the landfill environment because they allow the driver to identify the reflective vests of the spotters even in poor visibility conditions. Drivers, however, should never rely solely on their cameras and always check the work area first to confirm that there are no pedestrians in the vicinity before proceeding, and especially before backing.

**Whenever possible, one-way traffic flow patterns should be used to minimize cross traffic and the need for backing.**



## Exposure to hazardous materials

**Landfill and MRF workers can be potentially exposed to hazardous substances such as flammables, corrosives, reactive materials; biological or radioactive substances; medical sharps; asbestos, lead, compressed gases, and others that might be comingled with incoming waste. These materials can cause injury or illness through skin absorption, inhalation, or contact with pathogenic agents carried by vectors such as rodents and insects. They should therefore be trained to recognize hazardous materials and how to safely avoid their exposures.**

### Personal protective equipment (PPE)

Instruct workers to always assume the worst case when working around waste materials. Mandate that they wear the proper level of PPE to protect their skin, eyes, mouth, and nose, hands, and avoid cuts to the skin and accidental contact with chemicals. Provide workers with the proper tools to minimize manual contact with waste and train them to react to the identifiers of hazardous or unauthorized waste. Labels, warning stickers, unusual odors, container types, and waste manifests all offer clues as to the content or composition of the wastes. Encourage workers to seek assistance from their manager if they encounter a container, waste, or other item that they are uncertain about.

### Dust & airborne contaminant control

Airborne contaminant exposure can be limited by reducing dust generation and prolonged working in dusty environments. If mechanical means, such as wetting, dust extraction, or air filtering systems cannot eliminate the dust, then workers should be provided with suitable face and respiratory protection.

### Disease vector control

Birds, rodents, and insects may transmit bacterial, viral, and parasitic infections through bites or contact with infected material such as animal droppings. Avoid animals and insects and the areas where they may live on the landfill. Eliminate potential food and shelter sources and maintain good housekeeping. Workers must also wash their hands thoroughly before eating, drinking, or smoking. Encourage workers to seek prompt medical attention following exposures or suspected exposures to disease vectors.





# Construction hazards

Landfills often resemble active construction sites when undergoing cell expansions, replacing cover, installing liner systems, and performing excavations. And as with construction sites, the hazards can include but are not limited to trench collapses, falls from elevations, entering confined spaces, heavy equipment accidents, physical stressors, and other risks. MRFs also share some of these operational risks.

## Heavy equipment operator training

Heavy equipment operations are all too frequently the cause of accidents and traumatic injuries at landfills. Only trained operators should be permitted to run the equipment and access to active work areas should be strictly controlled. Operators should always be aware of potentially shifting ground conditions and take special care near slopes and trenches or on wet ground. Maintain safe clearances around construction equipment since soft areas are common at disposal sites and equipment can suddenly drop or slip. No employee should work around or under a raised bucket or blade and should never walk behind a moving piece of equipment. It is crucial that backup alarms, windshields, and other safeguards are in good operating condition and well maintained. Daily cleaning of loaders, compactors, and other equipment will help to control the buildup of combustible materials in exhaust manifolds and other hot surfaces that could lead to equipment or landfill fires.

## Excavation safety

Excavations can pose a variety of life threatening hazards. Employees can be struck by heavy equipment, caught in a trench collapse, or encounter hazardous atmospheres such as methane or hydrogen sulfide gas pockets. Equipment operators can also contact dangerous overhead or buried power lines or other utilities. Excavation teams should always include an experienced, competent person onsite to develop the excavation safety plan and oversee the project from beginning to end.

## Fall hazard prevention

Fall hazards can be present when workers are required to climb on top of heavy equipment or vehicles, when working from inspection platforms such as tarping stations, and when working near the edge of the working face. Potential fall exposures should be reviewed, and effective safety measures developed. Engineering controls are the preferred method of protecting against falls. These can include moving work to ground level if feasible; adding guarded work platforms, and ensuring that floor openings, open pits, and other potential fall hazards are securely covered. As a last alternative, employees should be trained and provided with proper personal fall protection measures.

Operators should always be aware of potentially shifting ground conditions and take special care near slopes and trenches or on wet ground.



## Strain and overexertion injury prevention

Workers are also at risk of overexertion injuries due to lifting, material handling, digging, and other strenuous activities. Material handling should be conducted with forklifts, conveyors, or other mechanical lifting devices as much as possible. If manual lifting is necessary, make sure that employees are trained in proper lifting techniques and instructed to seek help when lifting heavy or awkward objects.

## Welding & cutting safety

Welding and cutting activities require special safety controls to prevent exposures to burns, radiation, air contaminants, and fires. Landfills, however, have unique characteristics that require extra consideration when setting up a welding operation. Workers should only weld in designated areas where fire hazards and combustibles are safeguarded or better yet eliminated. Use of a hot work permit system and fire watch may be necessary if fire safe areas cannot be guaranteed. Always use ultraviolet (UV) shielding to protect people in the area from the arc flash, and to contain heat and hot spatter that could ignite trash and debris. In areas where landfill gases may accumulate, local ventilation, which removes welding fumes and gases at their source, is preferable to general ventilation, which merely dilutes fumes and gases to atmosphere; routine air monitoring should be conducted. Welders are taught to evaluate coatings on weld media for flammability or toxicity before they start work. This is especially important at a landfill where workers cut up debris for easier disposal. Workers should not weld or cut on painted or coated materials; remove surface coatings first if this is necessary. And workers must never weld or cut on used drums, barrels, tanks, or other containers unless they have been thoroughly cleaned.

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## Confined space entry

Permit-required confined spaces at the facility need to be identified, and a written confined space entry program developed to address their safe entry. This should be combined with lock-out tag out, engineering controls and personal protective equipment programs.

### Training

One of the most important aspects of the program is to train employees to recognize confined spaces and their hazards. Employees must understand that entrance is strictly prohibited except under carefully controlled conditions dictated by the permit requirements.

### Air monitoring

Employees must never trust their senses to determine if the air in a confined space is safe. They cannot see or smell many toxic gases and vapors, nor can they determine the level of oxygen present. Fatalities have resulted when employees simply leaned over an open tank to look inside, were overcome, and fell into the tanks where death resulted from the toxic atmosphere or from asphyxiation. Employees must also not conclude that the atmosphere in a confined space is safe because the materials stored there are benign. Toxic atmospheres can be created by the work being performed in the space, and by seepage from areas adjacent to the space.

## Landfill gases

Gases are a natural byproduct of landfill operations and are generated during the breakdown of organic compounds or released from containers that are delivered for disposal.

### Explosive gases

Methane is the most likely landfill gas constituent to pose an explosion hazard and is explosive between its lower explosive limit (LEL) level of 5% by volume and its upper explosive limit (UEL) of 15% by volume.

### Toxic gases

Other landfill gas constituents (such as ammonia, hydrogen sulfide, and benzene) are both toxic and flammable, and some (such as carbon dioxide or nitrogen dioxide) are not flammable or explosive but can cause suffocation by displacing oxygen from an atmosphere.

### Monitoring

Landfill gas venting and collection systems should be monitored for explosive and toxic gases. This is critically important during any subsurface or confined space entry work. Appropriate personal protective equipment should be utilized to protect workers from detected hazards.

## Asbestos hazards

Potential Asbestos Containing Material (ACM) sources include cement pipes, roofing shingles or felt, acoustical plaster, spray-on fireproofing, vinyl or asphalt floor tile, boiler gaskets, brake linings, heat-resistant gloves and aprons, wallboard, and heating ducts.

### Screening

Some landfills are permitted to accept properly packaged ACM which are then disposed of in dedicated areas. However, other municipal and construction/demolition landfill operators must screen incoming waste for hazardous materials. Asbestos can inadvertently enter the waste stream in the form of innocuous-looking building materials and other commonly disposed of products.

### Personal protective equipment

ACM is considered an inhalation hazard when it becomes airborne or “friable”. This can occur if it has been damaged or deteriorated due to age or neglect. Friable asbestos fibers are microscopic and easily inhaled. Serious diseases may occur if the fibers accumulate in the lungs, although they may not appear until years after the initial exposure. Asbestosis (scarring of the lung tissue), lung cancer, and mesothelioma (cancer of the chest cavity lining) are three of the most debilitating diseases directly attributed to exposure to asbestos. Identifying potential ACM and exercising appropriate controls is important and implementing respiratory protection programs is critical.

## Bloodborn pathogens

Bloodborne pathogens are microscopic organisms present in infected human blood that can cause diseases such as Hepatitis B and Human Immunodeficiency Virus (HIV). The most likely sources of pathogenic agents at landfills and MRFs are from contaminated medical wastes such as needles (sharps), bandages, hospital linens, lab samples, and other similar items. Biowastes are not typically permitted to be disposed at solid waste facilities but pose a hazard if they inadvertently get through the screening process and contact employees through needle sticks, blood splatter, or other such exposures.

### Biohazard awareness training

Employers must maintain an exposure control plan that includes employee recognition training and proper handling of potential pathogen contaminated materials. The first rule of exposure control is the practice of “universal precautions”, which dictates that all potentially contaminated materials be treated as if they are contaminated. This means employees should not handle suspected wastes without the use of appropriate engineering controls and PPE. Biohazards and medical wastes must be stored for disposal in sealed containers that contain the words “BIOHAZARD” and the universal biohazard symbol. If an inadvertent contact does occur, such as a puncture wound or splash to the mouth or eyes, the employer must provide post exposure evaluation and medical follow up. Employees should also be encouraged to receive Hepatitis B vaccinations as soon as possible in order to prevent possible infection.



## Responding to emergencies

Planning is the key to minimizing losses resulting from an emergency. The purpose of an emergency response plan is to establish procedures that will protect employees during an emergency and, if necessary, help safely evacuate the facility. All employees should frequently review emergency response plans and be familiar with the procedures. Their conduct and actions during the first few minutes of an emergency may save their own lives as well as those of fellow workers and other members of the community.

### Emergency planning

Landfill and MRF operators should develop emergency plans that address the potential for natural disasters, medical emergencies, hazardous spills, fire, atmospheric releases, evacuations, and security breaches. The plans should be written and provide the contact information of the emergency coordinator, responsible parties, and outside response agencies. A diagram of the facility with locations of flammables, stored hazardous materials, evacuation routes, assembly points, and emergency response equipment is also a valuable resource. Written plans should also be provided to local professional emergency responders (fire department, spill response team, county disaster agency etc.) so they can familiarize themselves with the facility layout and its response capabilities.

### Emergency training

Use written plans as a reference for employee training and ensure employees receive classroom and “hands on” emergency response training at least annually. More frequent and in-depth training is necessary for workers who are expected to play an active role in dealing with an emergency, such as if assigned to an in-house fire brigade or spill response team.

### Spill prevention and response

Spill response plans require special consideration since wastes of unknown origin and characteristics may inadvertently enter the landfill waste stream. Typically spills and releases at a landfill are a result of leaking waste containers, fuel or oil leaks from vehicles and heavy equipment, gas releases, or spills while working with chemicals. In all cases, the best spill response is prevention. Ensure that personnel screening waste deliveries can identify those chemical products that might be poorly labeled, improperly containerized, or intentionally disguised. Inspect storage areas for proper container storage and handling. Provide secondary containment in areas where bulk materials are being stored such as vehicle fueling areas, or where wastes may enter for sorting or processing. Isolate questionable containers or suspect materials and have spill cleanup supplies readily available. The proper response to a spill depends on the characteristics of the substance. Workers need to know their limitations in identifying and containing spilled materials, and when to summons outside spill responders to handle a large or hazardous spill situation. Even if employees do not attempt to contain a spill, they need to know how to properly protect themselves while they evacuate the area and seek assistance.

Develop emergency plans that address the potential for the following:



NATURAL  
DISASTERS



MEDICAL  
EMERGENCIES



HAZARDOUS  
SPILLS



FIRE



ATMOSPHERIC  
RELEASES



EVACUATIONS



SECURITY  
BREACHES

## Conclusion

Landfills and MRFs present a variety of challenging conditions that require constant monitoring and strict control measures to ensure the safety of employees and the many visitors to the facility they receive daily. This requires the proper assessment of potential hazards, the development of comprehensive safety plans, initial and ongoing safety training, emergency planning, and effective management oversight. To quote a recent article from trade publication *Waste Today*, “the primary contributors to working safely at a landfill are awareness, proper training, and attention to detail on the part of the owners and team members. Landfill operators must keep safety a priority and an ongoing part of the organization’s culture”. Embracing these landfill and MRF safety best practices and educating employees will help prevent accidents and keep your facility operating efficiently, safely and profitably.

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AXA XL's Environmental team  
505 Eagleview Boulevard | Suite 100 | Exton, PA 19341  
axaxl.com**

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